530 then through a plurality of tertiary aggregation nodes 535 to its final destination. This same mesh architecture of local service domains 515 also supports the reverse path to accept and collect (aggregate) data packets from the tertiary aggregation nodes 535 of a local service domain 515 for insertion on to a primary fiber metropolitan ring 505.

[57] Fig. 5b is an exploded view of a single local service domain from Fig. 5a. In this exemplary embodiment the connection between a primary distribution/aggregation node 510 and as secondary aggregation node 530 is fiber. The terms"exterior" and "interior" are used with respect to the local service domain mesh. The "exterior" tertiary aggregation nodes 535 are connected by a fiber mini-ring 540. Connections between the "exterior" tertiary aggregation nodes 535 and the "interior" tertiary aggregation nodes 535 and between "interior" tertiary aggregation nodes are by means of FSOC building links or millimeter wave radio frequency links 545.

[58] Fig. 5c is another exemplary embodiment of a single local service domain. Once again the connections between "exterior" tertiary aggregation nodes 535 and "interior" tertiary aggregation nodes 535 and between "interior" tertiary aggregation nodes 535 is by means of FSOC building links or millimeter wave radio frequency links 545. However, in this case the "exterior" tertiary aggregation nodes 535 are connected to each other via a FSOC mini-ring 550. The redundant path metropolitan ring back-up is via an "exterior" tertiary aggregation node and is an FSOC link 555.

[59] Fig. 5d is yet another exemplary embodiment of a local service domain. Fig. 5d is identical to Fig. 5c except that the secondary aggregation node 530 is connected to primary distribution/aggregation node 510 via an FSOC link rather than via fiber.

[60] The FSOC Mesh and Optical Routing Architecture illustrated in Figs. 5a and 5b rely on optical switching systems that are not restricted to single wavelengths, but are capable of selectively handling single and multiple wavelengths and included

customer packets, i.e. WDM and/or "coarse" WDM. The most current example of such technologies is MEMS based micro mirror switches that can route single or multiple wavelengths. New non-MEMS based "color blind" optical switches are being developed. The MEMS technology is suitable for slower routing processes (i.e., connecting customers but is unsuitable for high-speed packet-switching). The proposed grid mesh architecture is a dual layer system. The higher layer provides multi-wavelength (WDM) high capacity cross links in redundant/reconfigurable connectivity between routers within the mesh framework. The architecture's second layer (local routing distribution layer) is localized around each distribution node where each incoming wavelength reaching the node is interrogated for its packet information, and if matched to a local dynamically addressable customer look-up table 210, can be dropped to the local distribution routing layer from the distribution/aggregation routing layer and transmitted on to a local building (or customer 1's premises 260). The primary wavelength packets not detected for local drops are passed back into the out-going wavelength packet multiplexer 225 and on to the remultiplexer 220 for transmission on to the next node.

[61] The outgoing metropolitan mesh multi-wavelength bundled beams and their contained customer packets can be wavelength reassigned and rebundled by the aggregation nodes wavelength packet multiplexers into different branch directions at each node. Customer packets can be multiplexed onto other wavelength channels and directed to different outgoing FSOC transmitters and customer locations. Micro-laser arrays can be used at the bi-directional Lambda 1 to Lambda "n" converter 250 to select a different output wavelength to minimize a potential wavelength conflict at each sequencial node entry and exit wavelength channel (wavelength "crash" is the same wavelength with different customer packets arriving at the same time and same node receiver). The wavelength reconfigurable nature of this routing scheme provides full network redundancy by allowing routing of wavelength packets around a failure point and accessing a customer packet from a different mesh direction a different wavelength. The addition of backup millimeter wave parallel path radio links can be used to further

enhances the system branch redundancy, so as to help meet the requirement of "five nines" reliability.

[62] Fig. 6a depicts a conventional (known in the art) multi-path architecture using FSOC, that is, a star and branch distribution approach using single "dedicated" wavelength branches. A fiber from the central office provides the multiple wavelengths to the FSOC hub used for distribution locally. The distance between the concentric circles denotes the maximum "reliable" FSOC transmission distance between each node. From the FSOC distribution point, the wavelengths are distributed to a branch using a single wavelength. Assuming a break in the FSOC branch in the lower right, there is no redundancy so that branch would be out of service beyond the break.

[63] Fig. 6b is a multi-wavelength branch architecture with dedicated wavelength/ node distribution. This architecture is an evolvement of Fig. 6a increasing total link capacity within each branch by transmitting multiple wavelengths within each branch, but each sequential node extracts and distributes a dedicated wavelength until there are no wavelengths left. Depicted here are four nodes with four wavelengths distributed to the first node. One wavelength is dropped from the first node and distributed. That wavelength is no longer available but the remaining wavelengths are distributed to the second node where a second wavelength is dropped from and distributed. Similarly, the second wavelength is now no longer available. Similarly, the third node receives two wavelengths and one of these is dropped at the third node and distibuted. The fourth node receives a single wavelength, which is distributed. There is no possiblility in this arrangement to convert wavelengths either opticaly or electrically. Further, should a break occur between any two nodes then the remaining nodes would be without communications.

[64] Fig. 6c depicts a multi-wavelength architecture relayed to sequential nodes with localized packet add-drops and a branch distribution and a branch distribution. This configuration represents a true departure from Figs. 6a and 6b whereby